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AUTHOR Lee, Marjorie W.
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INSTITUTION Howard Univ., Washington, D.C. School of Education.
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ABSTRACT

Soon families of every socioeconomic level will have microcomputers in their homes. Most classrooms and probably all schools will have at least one such machine. Many potential advantages may result from the involvement of young children with microcomputers. Some of these are the stimulation of reflective thinking, the development of cognitive styles, and the improvement of self-esteem. Acquisition of computer skills may help young black children close the gap between home/community and classroom/school cultures. The microcomputer may also help black children to become better achievers in school and to be more successful on standardized tests. To realize these and related potentials, more teachers of young black children must develop computer literacy and acquire the ability to use the microcomputer as an educational tool. While use of microcomputers may result in benefits, several questions relating to teachers, the instruction of young children, and computer use remain to be answered. More information is needed in several areas related to instruction (such as reinforcement techniques, instructional needs of children, optimal scheduling, and fundamental changes in cognitive styles and development). Data are also needed regarding the influence of computer use on the black culture and on the individual's creative thinking and expressive language. (RH)

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Written by: Marjorie W. Lee, Ph.D.
Assistant Professor,
Department of Curriculum
and Teaching

Submitted to: Dr. Gabriel Ofiesh
Department of Educational Leadership
and Technology

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Early Childhood Education and Microcomputers

State of the Art

According to Damarin (1982) "computers will soon be everywhere that children are: at home, at school, at play". She states that as of 1981, one in every one hundred homes housed a home computer. With the rapid availability of low cost computers, this trend will continue with increasing numbers of computers in homes. The use of computers in elementary and nursery schools is also growing rapidly. Spencer and Baskin (1982) report information from the National Center for Educational Statistics as revealing that "the majority of computer-using schools now use micro-computers". The effectiveness or advantages of the use of micro-computers in schools and the availability of computers in homes is still unknown because this phenomena has occurred too rapidly for assessment. As late as 1979, most microcomputers were purchased for business rather than instructional use. Recreation centers and public facilities increasingly have computers as games, many of which are for preschoolers, e.g., the Future Center at the Capital Children's Museum in Washington, D.C. and the Computer Gallery at Sesame Place in Langhorn, Pennsylvania. The Capital Children's Museum also teaches children to program and use computers.

Paisley and Chen (1982) predict that "children will probably read more electronic text on the screens of microcomputers than on the screens of video text, teletext, or interactive cable systems." They reported that companies are currently making microcomputers available for $100.00. Discount stores are selling this equipment for $79.00 and less. Soon families of every socioeconomic level will have microcomputers in their homes, most classrooms and probably all schools will have at least one machine, and all entertainment centers will have microcomputer in order to attract customers and remain finaicial. Tipps (1983) estimates that 50% of the homes will have computers that are used by young children by 1990.

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This emergent generation of users will need multipurpose software and games. At present, Apple Computer Company has some programs that are appropriate for children aged 4 to 7 years old. Texas Instruments has Logo, a computer-based environments program that is structured so that even children as young as three years old can learn to program and use the computer to explore and discover in the process of solving problems. In order to communicate with the computer, young children learn to use numbers and spatial relationships, decision-making processes, and logical thinking skills. Of course, there are many computer-assisted instruction programs for young children but these are usually used for practice and drill of abstract academic information. These programs provide feedback or dispense information and thus, program the learning process.

Papert (1980) points out that young children need to have more active control of their learning as they use computers. They need to learn to think in a logical fashion so that they use the computer as a useful tool to stimulate thinking and for communication as well as problem-solving. With control over the computers processes, the young child not the computer controls the scope of the learning. However, Paisley and Chen (1982) do not forsee the software availability keeping up with the rapidly increasing demands. They predict that "in the forseeable future, parents and teachers will be hard-pressed to identify and obtain good software for microcomputers".

Child Development and Microcomputers

Piaget (1952) helped us know that preschool aged children 3 to 5 year olds are in the early part of the concrete operations phase of thinking (2 to 11 year olds). Chracteristic of these thinkers (in the pre-operational phase) is the employment of trial-and-error, induction, and persistence to arrive at conclusions relative to real objects. Montessori (1967) agreed that children learn from real objects and elaborated further by showing that children need to interact autonomously with these objects in their daily environment.

Montessori (1967, p.6) said that a child "has the power to teach himself". Papert (1980) points out that young children learn best when they can explore, manipulate, discover and "learn-without-teaching". Infact, several theorists reveal that young children have natural motivation to explore for information within their environment (Bruner, 1961; Montessori, 1967; Piaget, 1952; White, 1959). Vidler (1979) supports that discovery learning methods help students by generating involvement, enthusiasm, and interest in the learning process. Stott and Sharp (1976) found that preschool children's free play is effective in generating motivation to learn in both spontaneous play and in arranged play situations.

Paisley and Chen (1982) state that young children and computers have concrete thought "in common". They suggest that computers mirror children's own thought processes by leading them to engage in "reflective thinking" (the process of thinking about one's own thinking). In order to write a program or debug an operating program, the child has to visualize the parts of the problem so as to locate desired information or detect the errors. Writing a program calls for "hierachical thinking" and debugging one requires "procedual thinking". Preliminary findings of Sheingold and Pea (1981) show that programming computers does encourage development of problem-solving skills. Sheingold (1983) in a conference presentation suggested that microcomputers might help children get in touch with the symbolic aspects of what they already know or are learning about from other kinds of experiences.

Papert (1980) asserts that use of computers by young children "offers the opportunity for virtually unlimited creative expression". Adams (1974) suggests that there is a relationship between creative thinking and visual thinking. Solomon (1979) presents evidence that visual thinking skills can help train children in the internalization of these representations. Thus, children have control over thinking about and reproducing certain abstracted entities within their "real world" as they manipulate these entities in games or in solving problems.

Paisley (1980) predicts that exposure to computers may also influence the way individuals perceive information and cognitively act upon that information, thus exposure to computers may affect ones "cognitive style". Hungate (1982) found that a small group of disadvantaged kindergarteners did increase in acquisition of basic skills in math, visual discrimination and remembering after learning to program and use a microcomputer on a weekly basis over a seven month period.

Tipps (1983) proposes that "learning to use computers seems compatible with goals of cognitive, social, and emotional development. During the first six years of life children are rapidly developing cognitively. While children are learning many things, they are also engage in the process of self-definition, i.e., they are developing socially and emotionally. Papert (1980) finds that youngsters soon learn that computers are useful tools for communicating. Spencer and Baskin (1981) report studies that show children collaborate on lessons, and teach their peers games or to program the computer as frequently as they do in other tutoring sessions. Children

may receive positive socialization experiences while interacting with both the computers and their peers. Goodman (1980) argues that the computer extends the distance and duration (length) of children's written messages. An implication is that computers may replace letters via the mail as ways to communicate with others who are at a distance from the young person, thus written communications may regain status as a medium of communication.

Papert (1980) and Sheingold and Pea (1981) are documenting evidence that several benefits from computer exposure have positive affect on children's self-esteem. Papert (1980) and Goodman (1980) agree that computers can give children new opportunities and new control over parts of their environment. Coopersmith (1967) shows that "competence" is one important component of self-esteem and Brim (1976) and others show that control over one's environment is another component of self-esteem.

Papert states in the 1982 issue of Electronic Education that the computer "attracts and holds young people's attention, it stimulates their interest and gets them actively involved in the learning process". Pat Mattingly, Director of the school where Logo was field-tested, says that "three-year olds are not the least bit intimidated by the computer...They are totally in command...and the knowledge they pick up is remarkable...They love it". Paisley and Chen (1982) point out that children's self-esteem may increase as they master the computer because most adults (who often have inhibitions regarding computers) value those with computer skills and provide positive reinforcement to individuals who have computer literacy.

Learning Styles of Blacks and Microcomputers

Cohen (1969) has identified two styles of learning: analytical style and the relational style. These two learning styles describe how people select and classify information. In the analytical style attributes have significance only in reference to the total context of the whole. While individuals who have the relational style, think attributes of a stimulus have significance in themselves. These two styles affect very different ways of functioning. The relational style is compatable with creativity in the arts. The black community is filled with a high degree of the visual, audio and creative arts, and expressiveness is cultivated and valued. Thus, many black children learn relational learning styles early in their development. Schools require and reward the analytic style which is compatable with concentration alone for long periods of time, impersonal learning stimuli and other abstractions to be dealt with according to a schedule (Hale, 1982).

Computers provide high visual and audio stimuli while allowing the individual to creatively express him or herself. Thus, it utilizes relational thinking to enable the person to engage in analytical thinking. The addition of computer usage and literacy in the early years of learning for black children might provide all of the cognitive, social, and emotional benefits listed above as well as socialization into an analytical style of learning.

The microcomputer shows promise for helping black children become better achievers in shcool and more successful on standardized tests. As they become involved in their interactions with the machine they will learn to sit for long periods of time engaging in reflective thinking, procedural thinking, hierachical thinking, creative thinking, decision-making and critical thinking. Each of these types of thinking are basic to logical skills involved in the analytical learning style. A study condicted by Hungate (1982) encourages this expectation. She found that low-income, disadvantage kindergarteners improved in basic math skills, visual discrimination and telephone number practice by learning to use the microcomputer. She concluded that "children can both learn to use and learn from using computer programs which are tailored to their age level".

Cole (1971) believes that cognition develops in conjuntion with the behaviors in which people engage in their everyday lives. Havighurst (1976) states "that within a complex society, social classes and ethnic groups are the two major ecological structures that produce diversity in human life style and development. Each social class system consists of groups of people who each have a set of behaviors and attitudes that define it (the social class) and separate it from the other social classes. Similarly, the system of ethnic groups consists of groups of people who each have a common history and generally share a language, a religion, or a racial identity". This being the case, then more teachers of young black children need to learn about the computers for their own basic literacy but also for the purpose of using it as a tool for use with children. Besides, these teachers need to be able to help black children use their ethnic heritage, values, learning styles environmental culture, creativity and language as content to be use in computer discovery learning.

Garry and Favors (1975), two faculty members at Howard University's Institute for Urban Affairs and Research, have compiled papers from a research workshop on the topic of "Restructuring the Educational Process: A Black Perspective." Smilansky (1978) discusses how disadvantage gifted youth who are given appropriate education learn to help themselves. Hale (1982) proposes that a curriculum for Black children must have teaching strategies, teaching techniques and content which are (1) pedagogically relevant to the learning styles of Black people, (2) academically regorous in that they are geared toward acquisition of the basic academic skills,

and (3) reflective of the Black Experience including its heritage and promotion of political advocacy. Inclusion of information such as this with competence in computer literacy would provide young Black children with experiences needed to function in the Black community while also developing skills needed for school success.

Children with Handicaps and Computers

Paisley and Chen (1982) propose that microcomputers may especially benefit children with physical, mental, or emotional disabilities. Weir (1981) states that microcomputers can be "equalizers" for children who may be unable to compete with non-handicapped children in regular learning and performance situations. Fay (1982) describes methods for testing and instructing children with severe physical disabilities using new technology. The microcomputer is one of the innovations through which help such as nonvocal communication and computer-assisted instruction can be provided.

All children, including those who think predominately with a relational style, those who have impairments, and those who may be bilingual (or have limited English Proficiency), "gain a greater understanding of the world, including the thought processes of themselves and others by being able to use different viewpoints and operate within different constructs" (Shaw, 1982).

Needs in ECE Relative to Microcomputers

Baskin and Spencer (1981) pose the following questions relative to teachers of young children and the use of computers:

1. How will the use of microcomputers affect curriculum development, the role of the teacher in instruction, the design of textbooks and how children are scheduled for instruction?

2. How will increased computer use in many sectors of teacher preparation influence instruction for children?

3. Who will train teachers, professors and parents in computer literacy?

4. What kinds of teams of content specialists and programmers should collaborate to produce high quality lessons and programs that are effective for teaching?

Damarin (1982) warns that investigations are needed to determine the extent to which children acquire patterning, sequencing, and conditional reasoning in the creation of programs in the computer environment at earlier ages than they have in the past. She also recommends studies to find out the extent to which these abilities generalize, both among computer environments, and from computer environments to other situations.

Spencer and Baskin state four categories in which more information is needed relative to young children and their use of microcomputers: (1) reinforcement techniques, (2) instructional needs, (3) scheduling, and (4) fundamental changes in cognitive styles and development. These issues are:

Reinforcement Techniques

1. The relationship between the use of graphics and receipt of immediate feedback during computer usage. Do these features influence children's learning and the child's sense of satisfaction from use of the computer?

Instructional Needs

2. What are the best mix of programs that allow students to work through sequences of activities independently? What programs require teachers to review student's work and suggest the next sequential lessons.

Scheduling

3. What are the problems to be solved in scheduling student's time on the computer so that children's needs are addressed (and the teacher's plans for each student are included?

Fundamental Changes

4. How much interaction between each student and the teacher is optimal?

5. What kinds of social activities should be structured for students?

6. How much time should students be together in educational activities to encourage cooperative learning, skill development and social learning?

Investigations of the extent to which an analytical learning style develops from use of a microcomputer needs to be studied. The influence of acquiring this skill should be examined in relationship to maintenance of competence in use of the relational learning style. In addition, information is needed relative to computer usage and successful school achievement as well as increased scores on standardized achievement tests. The Black Community

values and rewards creativity and self-expression. Data regarding the influence of computer usage on the black culture and on an individual's creative thinking ability as well as expressive language are also needed. Juxtaposed to these studies is a need to identify the software and its quality that is available regarding black culture and use of creative skills.

The quality of software and its effectiveness in teaching the exceptional child also needs to be researched. The extent to which computer literacy is gained by individuals with different handicaps and their impairments are remediated also need to be documented. Other research is needed to investigate the extent to which non-English Proficiency Children continue to develop cognitively by using the microcomputer while they are also learning English. These studies may also help us know if computer usage assist in the process of becoming fluent in English or whatever is the second language.